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EXAMINER	
LEE, SHUN K	

ART UNIT	PAPER NUMBER
2878	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/892,855	INOUE ET AL.	
	Examiner	Art Unit	
	Shun Lee	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 February 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4 and 7-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,7-13 and 15-20* is/are rejected.

7)☒ Claim(s) *14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 June 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *0204*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 1, 15, and 16 are objected to because of the following informalities:

(a) in claim 1, "a" on line 5 should probably be --an--;

(b) in claim 15, "image reconstructing means" on line 10 should probably be --said processing means-- (see claim 1);

(c) in claim 16, "adjusting means" on line 3 should probably be --said adjusting means-- (see claim 1); and

(d) in claim 16, "said image reconstructing means" on line 7 should probably be --said processing means-- (see claim 1).

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 12 and 13 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The specification discloses (pg. 6, lines 16-22) that "If the scintillation detector 44 comprises a position-sensitive photomultiplier or a one-dimensional array of

photodiodes, then each of the collimator 30 and the scintillate 42 is also in the shape of a one-dimensional array, and the gamma camera 16 is scanned in a direction perpendicular to the arrays of the collimator 30 and the scintillator 42". Thus the specification discloses the use of an one-dimensional array collimator with an one-dimensional array of photodiodes.

Independent claim 1 has been amended to include the limitation of an one-dimensional array of detecting elements. Dependent claim 12 recites the limitation of a collimator having a two-dimensional array of apertures defined according to a rule of an M array and dependent claim 13 recites the limitation of an M-array collimator having a two-dimensional array of apertures over at least one period. However, the use of a two-dimensional array collimator with an one-dimensional array of detecting elements was not described in the specification.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-4 and 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gourlay (US 4,435,838) in view of Barrett *et al.* (US 6,392,235) and Kiri (US 4,891,844).

In regard to claims **1** and **11**, Gourlay discloses (Fig. 1) a gamma camera apparatus comprising:

(a) detecting means (10) for detecting gamma rays emitted from an examinee (object 14 such as a patient; column 6, lines 53-56);

(b) an encoding aperture plate (11) disposed between the examinee (14) and said detecting means (10);

(c) adjusting means (not illustrated but described in lines 46-65 of column 3) for adjusting the distance (D-d) from said detecting means (10) to said encoding aperture plate (11) to adjust the position (see arrow 13) of said encoding aperture plate (11) depending on the depth (column 2, lines 3-22) of an observation position (17) in the examinee (14);

(e) processing means or image reconstructing means (15, 18) for reconstructing an image based on the gamma rays detected by said detecting means (10) through said encoding aperture plate (11); and

(f) image display means (19) for displaying the reconstructed image.

While Gourlay also discloses (column 1, lines 8-11) that the apparatus is particularly applicable to medical imaging systems using gamma rays, the apparatus of Gourlay lacks an explicit description that the gamma rays are emitted from a radioisotope administered to the examinee in order to construct a three-dimensional image representing a distribution of the radioisotope in the examinee and that said detecting means comprises a one-dimensional array of detecting elements with said encoding aperture plate comprises a collimator having a one-dimensional array of apertures. However, medical imaging systems using gamma rays are well known in the art. For example, Barrett *et al.* teach (column 1, line 25 to column 3, line 60) that known medical imaging systems use gamma rays emitted from a radioisotope administered to the examinee in order to construct a three-dimensional image (*i.e.*, spatial mapping) representing a distribution of the radioisotope in the examinee. Further, Kiri teaches (column 1, lines 9-39) that a conventional measure to reduce expense is to replace a 2-D sensor with a scanning 1-D sensor. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to reduce the two-dimensional aperture array and detecting array to an one-dimensional aperture array and detecting array in the apparatus of Gourlay, in order to perform a known medical (*e.g.*, emission) imaging for obtain a radioisotope spatial distribution map reconstructed from the detected gamma rays emitted from a radioisotope administered to the examinee with reduced expense.

In regard to claim **2** which is dependent on claim 1, while Gourlay also discloses (column 4, lines 42-65; column 4, lines 38-68) that said adjusting means comprises

means for adjusting an enlargement ratio α of said encoding aperture plate with respect to said detecting means, the apparatus of Gourlay lacks an explicit description that the enlargement ratio as viewed from said observation position is in a range from 1.5 to 3.5. However, Gourlay further discloses (column 5, lines 1-22) that magnification should be chosen based on detector resolution. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to select an enlargement ratio (*e.g.*, 1.5 to 3.5 as viewed from the observation position) for the apparatus of Gourlay based on the available detector resolution.

In regard to claims **3** and **4** which are dependent on claim 1, while Gourlay also discloses (column 1, lines 8-11) that the apparatus is particular applicable to medical imaging systems using gamma rays and (column 3, line 66 to column 4, line 10) that the detector (10) is for example an Anger camera which is typically a NaI crystal, the apparatus of Gourlay lacks that the detecting means comprises a plurality of semiconductor detecting elements made of CdTe or CdZnTe. However, medical imaging systems are well known in the art. For example, Barrett *et al.* teach (column 1, line 25 to column 3, line 60) that known medical imaging systems use scintillation cameras or semiconductor gamma ray cameras comprising of cadmium zinc telluride (*i.e.*, CdZnTe) which provide higher resolution than scintillation cameras. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide CdZnTe semiconductor detecting elements as the detecting means in the apparatus of Gourlay, in order to obtain high resolution.

In regard to claim **12** which is dependent on claim 1, Gourlay also discloses (column 5, lines 1-22) that said encoding aperture plate comprises a collimator having a two-dimensional array of apertures defined according to a rule of an M array.

In regard to claim **13** which is dependent on claim 1, Gourlay also discloses (column 5, lines 1-22) that said encoding aperture plate comprises an M-array collimator having a two-dimensional array of apertures over at least one period (*i.e.*, spatial periodicity).

7. Claims 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gourlay (US 4,435,838) in view of Barrett *et al.* (US 6,392,235) and Kiri (US 4,891,844) as applied to claim 1 above, and further in view of Worstell (US 5,600,144).

In regard to claims **7-10** which are dependent on claim 1, while Gourlay also discloses (column 1, lines 8-11) that the apparatus is particular applicable to medical imaging systems using gamma rays and (column 3, line 66 to column 4, line 10) that the detector (10) is for example an Anger camera which is typically a NaI crystal, the modified apparatus of Gourlay lacks an explicit description that the detecting means comprises a scintillator made of NaI:Tl for converting the wavelength of gamma rays, and a position-sensitive photomultiplier interconnected by an optical fiber or a plurality of photodiodes for detecting light obtained by said scintillator. However, medical imaging system detecting means are well known in the art. For example, Worstell teaches (column 7, lines 18-40; column 10, lines 17-27) that medical imaging system detecting means comprises of a scintillator made of a material such as NaI:Tl or LSO (Table 1) for converting the wavelength of gamma rays, and a position-sensitive

photomultiplier (PS-PMT) interconnected by an optical fiber or equivalently a plurality of photodiodes for detecting light obtained by said scintillator. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide as the detecting means in the modified apparatus of Gourlay a known detecting means such as a PS-PMT interconnected by an optical fiber or equivalently photodiodes for detecting light from a NaI:Tl scintillator.

8. Claims 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gourlay (US 4,435,838) in view of Barrett *et al.* (US 6,392,235) and Kiri (US 4,891,844) as applied to claim 1 above, and further in view of Pelizzari *et al.* (US 4,977,505) and Liebig *et al.* (US 5,672,877).

In regard to claims **15-20** which are dependent on claim 1, the modified apparatus of Gourlay lacks an image supply means comprising a computerized tomography diagnostic device, a nuclear medicine diagnostic device, a magnetic resonance diagnostic device, or a digital camera device for supplying an image to be used in superposed relation to said reconstructed three-dimensional image. The need for coregistration of medical images is well known in the art (see for example, column 1, line 15 to column 2, line 59 of Pelizzari *et al.* or column 1, line 13 to column 2, line 38 of Liebig *et al.*) Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide an image supply means in the modified apparatus of Gourlay, in order to coregister medical images from different imaging modalities.

Allowable Subject Matter

9. Claim 14 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter: the instant application is deemed to be directed to an nonobvious improvement over the invention patented in US Patent 4,435,838. The improvement comprises in combination with other recited elements, that an observation range for a detection plane of said detecting means in the examinee is at most $L \cdot (D + Z)/D$ where L represents the length of one period of said apertures, Z the distance from said collimator to the observation position in said examinee, and D the distance from said collimator to said detecting means.

Response to Arguments

11. Applicant's arguments filed 6 February 2004 have been fully considered but they are not persuasive.

Applicant argues (pg. 8-9 of remarks filed 6 February 2004) that Kiri raises a "possible" (*i.e.*, hypothetical) conventional measure, which might be considered to reduce complexity and cost, but quickly dismisses this as a practical measure due to its more serious disadvantages. Examiner respectfully disagrees. Kiri states (column 1, lines 16-33) that "In such a case it makes the system very complex and expensive to provide such a numerous number 10^6 of radiation sensors in correspondence to the number of pixels. A possible conventional measure to overcome the above

disadvantage and difficulty is to scan the imaginary plane of image receiving with a single radiation sensor two-dimensionally or with a series of linearly arrayed radiation sensors one-dimensionally (in the direction vertical to the array). However, such a scanning method by a single sensor or arrayed sensors has a decisive disadvantage that not only it takes a long time to complete the scanning over the entire area of the image receiving plane, but also the efficiency of radiation detection is very low because the radiation irradiating the image receiving plane is wasted except for a successively traveling spot or linear region where the scanning single sensor or sensor array is being irradiated". Thus Kiri teaches that a one-dimensional sensor array has both advantages (less complex and less expensive) and disadvantages (long scanning time and low radiation detection efficiency). It is important to recognize that Kiri does not teach that a one-dimensional sensor array is inoperable or even unpractical. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to substitute an one-dimensional aperture array for the two-dimensional detecting array in the apparatus of Gourlay when it is more important to reduce expense as compared with reducing scanning time or increasing radiation detection efficiency.

Applicant argues (sixth paragraph on pg. 9 of remarks filed 6 February 2004) that neither of the secondary references provides a clear teaching for reconstructing a three-dimensional image based on gamma rays, displaying the reconstructed three-dimensional image, and supplying an image from another image source, which is superimposed on the reconstructed three-dimensional image. Examiner respectfully disagrees. Liebig *et al.* state (column 1, lines 53-58) that "For example, the physician

may wish to view the images as superimposed upon each other, so that a location in the body represented in one image can be more easily and more accurately related to the other images. The superimposing of different images of the same subject matter is sometimes referred to as "coregistration"" and (column 5, lines 30-35) that

" ... tomographic reconstruction is performed to generate multiple slice images or a three-dimensional image of an organ. FIG. 2 shows portions of a gamma camera system configured to perform a transmission scan of a patient 5". Thus Liebig *et al.* teach reconstructing a three-dimensional image based on gamma rays, displaying the reconstructed three-dimensional image, and supplying an image from another image source, which is superimposed on the reconstructed three-dimensional image since the physician may wish to view the images as superimposed upon each other.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shun Lee whose telephone number is (571) 272-2439. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (571) 272-2444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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